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(71) Applicants
Myson Group Limited,
Industrial Estate, Ongar,
Essex CM5 9RE
(72) Inventor
David Michael Brown
(74) Agents
Brewer & Son, 5—9
Quality Court, Chancery
Lane, London, WC2A 1HT

(54) Manifold

(57) A manifold 1 for a flat plate solar collector panel comprises a plurality of branch passages 2 each for connection with a branch fluid flow tube 7, the passages being defined by wall surfaces 6 which are flared outwardly with respect to the longitudinal axis of the manifold. The holes may be formed by drilling pilot holes, inserting a forming tool and then withdrawing it into a bell saddle with simultaneous rotation of the tool (Figure 4).

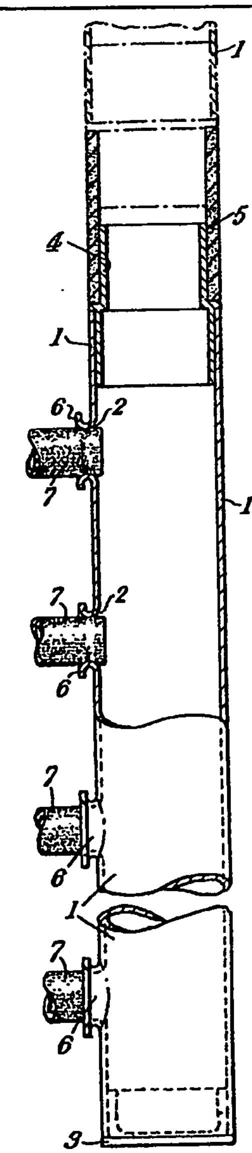

Fig. 1.

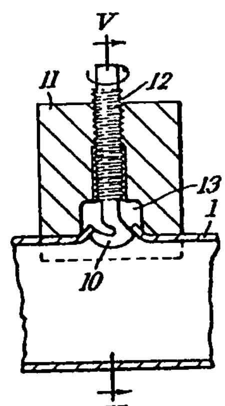

Fig. 4.

The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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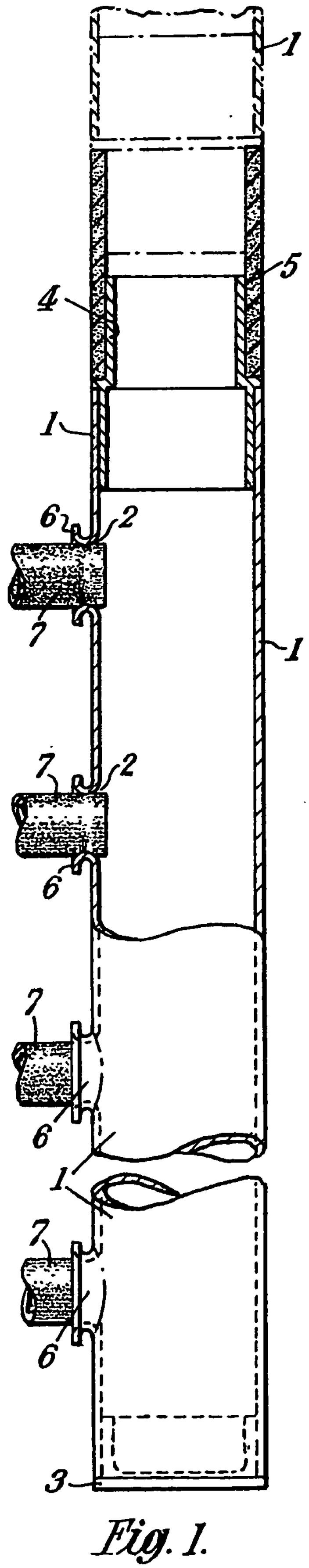

Fig. 1.

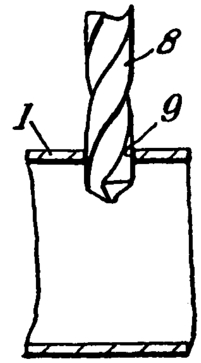

Fig. 2.

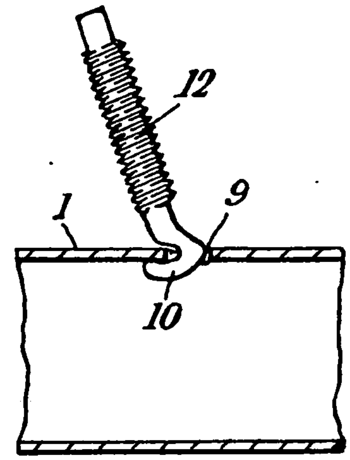

Fig. 3.

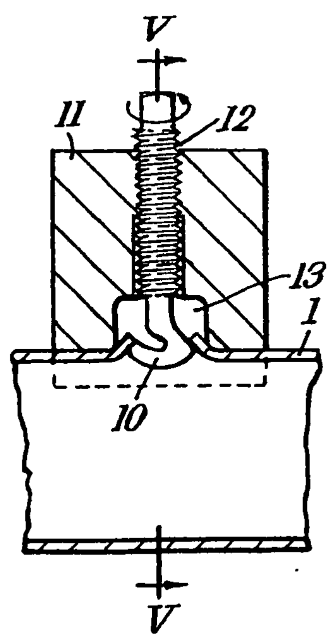

Fig. 4.

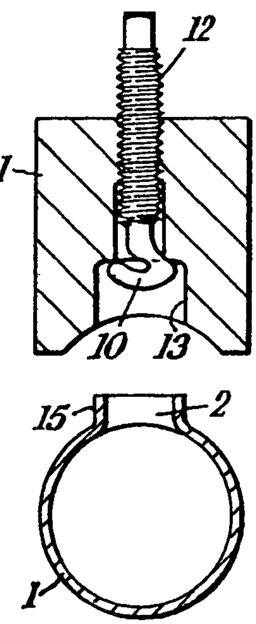

Fig. 5.

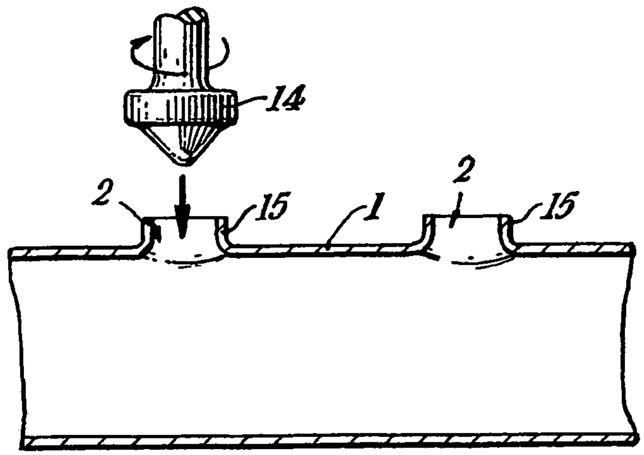

Fig. 6.

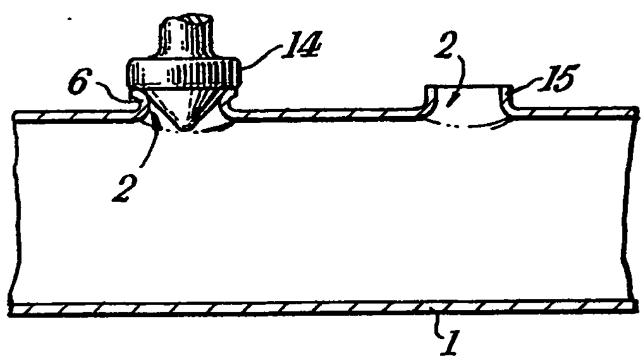

Fig. 7.

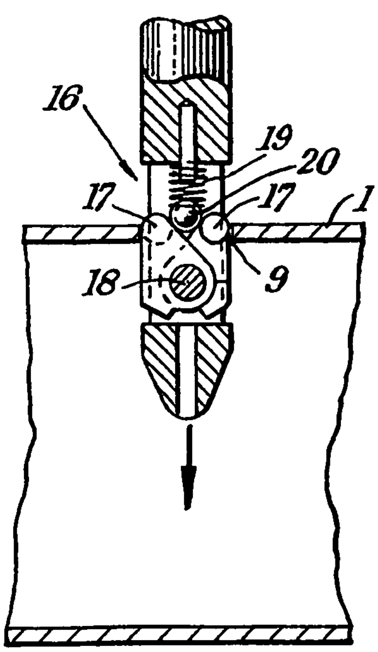

Fig. 8.

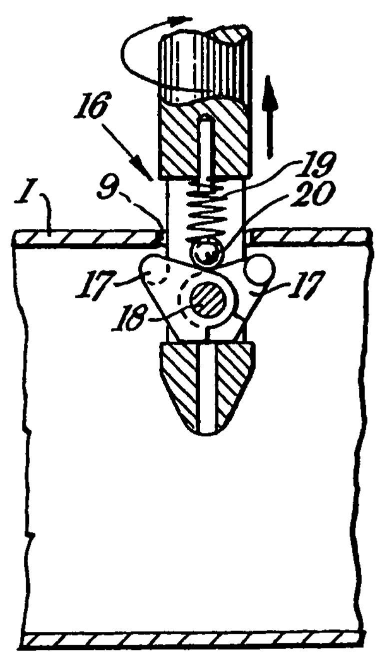

Fig. 9.

SPECIFICATION
Manifold

This invention relates to an elongate (usually cylindrical) manifold having a plurality of h les in a wall thereof, along the length of the manifold.

Manifolds of this type are useful in flat plate solar heat collector panels, one example being disclosed in the specification of British Patent Application No. 2019555A. In that specification, manifolds are provided with a plurality of nipples to which individual solar collector tubes are connected. A significant part of the manufacturing cost of the manifolds is the cost of connecting the nipples to the cylindrical manifold tube.

It is an object of the present invention to provide manifolds which are cheaper to produce and more convenient in use than those previously proposed.

According to the present invention there is provided an elongate fluid flow manifold, having a plurality of holes disposed along the length of the manifold, wherein each of the holes is a passage for communication with a branch fluid flow tube, the passage being defined by wall surfaces which are flared outwardly with respect to the longitudinal axis of the manifold.

Preferably, the passages are necked. To make a connection between the manifold and the tubes to be connected to it, the individual tubes need only be pushed into the necked passages. It may be advantageous, for example where the connection is to be water-tight, to insert into the end of each tube a resilient or rigid sleeve which is so arranged that when the end of the tube and the sleeve is inserted into the necked passage the sleeve forces the tube against the periphery of the passage to provide a seal between the flexible tube and the passage.

It is considered that the manifolds of the invention have advantages over certain other manifolds contemplated by the present applicants, in which necked passages through the cylindrical wall of a cylindrical manifold are formed by flaring corresponding holes in the manifold radially inwardly with respect to the longitudinal axis of the manifold, in that inward flaring may reduce the fluid-carrying capacity of the manifold, and quality control is less easy than with an outwardly flared arrangement.

One embodiment of manifold according to the invention, and two methods of making it, will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a view of part of the manifold from one side thereof, partly cut away to reveal an axial section of ne end of the manifold;

Figs. 2 to 7 are sections of the manifold taken through one f th h les thereof, showing schematically various stages in the f rmati n f ne of the necked passages;

Fig. 5 being in a plane V—V transverse to that of Figs. 2, 3, 4, 6 and 7, which figures are fragmentary; and

Figs. 8 and 9 are fragmentary axial sections drawn t a larg r scale, f one of the holes, showing an alternative method of forming the necked passag s.

Th manifold in Figure 1 is a thin-walled copper tube 1 of outside diameter 28 mm. Disposed in a single line along its length are twenty eight holes 2 at a repeat spacing of 40 mm. Only four of these holes are shown in Fig. 1. The manifold may be sealed at one end by a cap 3 or may be connected at one or both ends to a further manifold or a fluid flow circuit. For this purpose there can be used a connector 4 and synthetic rubber tubes 5.

The holes 2 are necked passages defined by flared walls 6 formed from the copper manifold wall. These passages accommodate branch fluid flow tubes 7 of a flat plate solar collector panel. The tube 7 fit in a fluid-tight manner within the walls 6 and this fit can be made more secure by use of an annular insert (not shown) of rigid or resilient material such as NYLON (trade mark) disposed within the branch tubes 7 at the narrow neck portion of the flared walls 6.

In Figure 2, a conventional drill bit 8 is employed to form a pilot hole 9 in the cylindrical wall of the copper manifold 1.

In Figure 3 a hook-shaped, rotary, extruding tool 10 is inserted obliquely, as shown, into the pilot hole 9. Thereafter, as shown in Fig. 4, the tool 10 is arranged with its axis of rotation lying along an outward radial of the longitudinal axis of the manifold and a bell saddle 11 is fitted round the shaft 12 of the extruding tool.

Rotation of the extruding tool 10, and simultaneous withdrawal of the tool along the outward radial in which its shaft 12 lies has the effect of drawing the material of the copper manifold surrounding the pilot hole 9 outwardly with respect to the cylindrical wall of the manifold, and conforming this material to the shape of a recess 13 in the bell saddle 11.

As shown in Figure 5 this step in the formation of the necked passage is completed by withdrawal of the extruding tool 10 from the manifold, leaving the material surrounding the pilot hole 9 projecting radially outwardly of the manifold.

The next stage is, as shown in Figures 6 and 7, to bring a rotary swaging tool 14 into registry with the outwardly projecting walls 15 of the hole, and move the tool 14 inwardly with respect to the manifold with rotation of the tool to flare the radially outer end of the walls 15 of the hole thereby to neck the passage. The swaging tool 14 is then removed from the manifold.

The steps of the alternative method shown in Figures 8 and 9 will be apparent from study of the figures. A forming tool 16 having two forming blades 17, urged to a radially ext nded positi n on a pivotal mounting pin 18 by a spring 19 through an intermediate ball 20, is ins rted in the pilot hole 9 until the blades 17 move to their extended positions within the manifold 1. The tool 16 is then rotated and simultaneously withdrawn upwardly (with use of a bell saddle 11 if required) as in Figures 4 and 5 so that th blades form the hol which may then be further shaped as in

Figures 6 and 7.

The remaining necked passages f the manifold 1 can be made one by one or, given suitable apparatus, simultaneously with the passage whose formati n is shown in the drawings.

CLAIMS

1. An elongate fluid flow manifold, having a plurality of holes disposed along the length of the manifold, wherein each of the holes is a passage for communication with a branch fluid flow tube, the passage being defined by wall surfaces which are flared outwardly with respect to the longitudinal axis of the manifold.

2. A manifold as claimed in claim 1 wherein the flared wall surfaces are unitary with the other wall surfaces of the manifold.

3. A manifold as claimed in claim 1 or 2 wherein each said passage is necked.

4. A manifold as claimed in claim 1, 2 or 3, the manufacture of which involves the steps of forming a hole in the wall of a manifold member, inserting a shaping tool in the formed hole and withdrawing the shaping tool thereby to shape the hole.

5. A manifold substantially as hereinbefore described with reference to, and as shown in, the drawings.

6. A solar heat collector panel comprising one r more manifolds as claimed in any one of the preceding claims.

7. A solar panel as claimed in claim 6, as dependent upon claim 3 wherein a synthetic rubber branch tube is inserted in each of the said passages of the manifold.

8. A solar panel as claimed in claim 7 wherein the branch tube contains an annular insert for maintaining the outside wall surface of the branch tube in fluid-tight contact with the neck of the passag of the manifold.

New claims or am ndments to claims filed on 12th June 1981.

Superseded claims 1, 3, 4, 7 and 8.

New or amended claims:—

1. An elongate fluid flow manifold, having a plurality of branch passages disposed along the length of the manifold, each passage being defined by wall surfaces which are flared outwardly with respect to the longitudinal axis of the manifold to provide a flared mouth to the passage adapted to receive with a fluid-tight fit an elastomeric branch fluid flow tube.

3. A manifold as claimed in claim 1 or 2 and made of copper.

4. A manifold as claimed in claim 1, 2 or 3, the manufacture of which involves the steps of
i) forming a hole in the wall of a manifold member,
ii) inserting a shaping tool in the formed hole
iii) withdrawing the shaping tool thereby to draw outwardly of the manifold the material forming the wall surfaces of the branch passage, and
iv) swaging the outwardly drawn material to provide said flared mouth.

7. A solar panel as claimed in claim 6, wherein a synthetic rubber, branch fluid flow, solar heat exchanger, tube is inserted in each of the said passages of the manifold.

8. A solar panel as claimed in claim 7 wherein each synthetic rubber branch tube contains an annular insert for maintaining the outside wall surface of the branch tube in fluid-tight contact with the neck of the passage of the manifold.

9. A method of manufacturing a fluid flow manifold, substantially as hereinbefore described with reference to Figures 1 to 7, or Figures 8 and 9, of the accompanying drawings.

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